OPERATING SUMMARY

MARKHAM VILLAGE

water pollution control plant

1968

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Division of Plant Operations

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Water management in Ontario

Ontario
Water Resources
Commission

135 St. Clair Ave. W.
Toronto 7
Ontario

We are pleased to present you with the Operating Summary for the water pollution control facilities operated for you during 1968.

Both the financial and technical information presented should be of assistance to your present and future planning in this important phase of municipal activity.

A new format has been devised to allow greater readability with equally detailed content. We trust that this will meet with your approval.

Our staff wish to express their appreciation for your co-operation throughout the year.

D. S. Caverly,
General Manager.

D. A. McTavish, P. Eng.,
Director,
Division of Plant Operations.

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MARKHAM VILLAGE
water pollution control plant

operated for

THE VILLAGE OF MARKHAM

by the

ONTARIO WATER RESOURCES COMMISSION

1968 ANNUAL OPERATING SUMMARY

FOREWORD

● This operating summary outlines the project's technical capabilities and financial status in 1968. Such information mirrors past and present performance, but a major intention is to anticipate the future -- to solve problems before they occur.

The new format in which this year's data are presented is designed to offer a higher level of readability than in the past, without a corresponding decrease in compactness, accuracy and detail.

Although your Regional Operations Engineer carries the major responsibility for the contents of the report, those involved in its preparation are attached to several Commission sections and divisions. The statistics section of the Division of Plant Operations compiled the information for the graphs and charts. The draughting section of the Division of Sanitary Engineering drew the graphs. The Division of Finance provided all cost data.

Only the close co-operation of these departments allowed the publication of this summary.

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'68 REVIEW

The total operating cost for the plant was $21,533.20 in 1968, an increase of approximately six percent from $20,300.68 in 1967. The cost per million gallons of raw sewage treated was $105.46, and the cost per pound of BOD removed was 11.5 cents.

The total gallons of raw sewage treated in 1968 reached 204.18 million, based on a prorated flow for November and December when the flow meter was out of service. This is a decrease of 10 percent from the total flow in 1967. The average daily flow was 550,000 gallons per day, which meant the plant averaged a 60 percent hydraulic overload in 1968.

An average of 8.2 tons of BOD and 10.05 tons of suspended solids per month were removed during the first seven months of 1968. The average removal efficiencies for BOD and suspended solids were 60 percent and 56 percent respectively. These poor efficiencies are a result of the severe hydraulic overload on the plant. Approximately 672 cubic feet of grit were removed from the raw sewage in 1968, a 100 percent increase over 1967.

A total of 657,600 gallons of raw sludge were pumped to the digester during 1968. A total of 142,500 gallons of digested sludge were placed on the drying beds, and 40,000 gallons were hauled away by truck.

A total of 10,264 pounds of chlorine was used in 1968 to maintain a 0.5 mg/l chlorine residual in the effluent.

Construction of the plant extension began in August. The extension which will double the capacity to 668,000 gallons per day, was substantially completed by the end of the year.

PROJECT COSTS

NET CAPITAL COST (Final) Long Term Debt to OWRC	$608,711.07
Debt Retirement Balance at Credit (Sinking Fund) December 31, 1968	$122,941.62
Net Operating	$ 21,533.20
Debt Retirement	12,284.00
Reserve	3,153.96
Interest Charged	34,175.11
TOTAL	$ 71,146.27

RESERVE ACCOUNT

Balance at January 1, 1968	$ 21,189.38
Deposited by Municipality	3,153.96
Interest Earned	1,324.35
	$ 25,667.69
Less Expenditures	-
Balance at December 31, 1968	$ 25,667.69

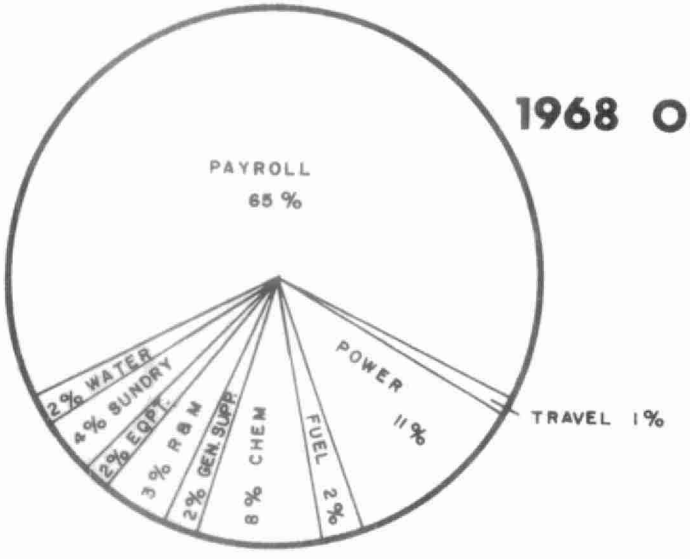
Monthly Operating Costs

MONTH	TOTAL EXPENDITURE	PAYROLL	CASUAL PAY ROLL	FUEL	POWER	CHEMICAL	GENERAL SUPPLIES	EQUIPMENT	REPAIRS & MAINTENANCE	SUNDRY	WATER	TRAVEL
JAN	1286.19	958.22	-	-	198.42	-	14.00	-	103.00	12.55	-	-
FEB	1703.68	949.88	-	108.87	211.42	228.38	28.86	49.12	-	15.28	94.65	17.22
MAR	2207.52	1532.34	-	109.63	200.08	238.61	15.42	-	50.00	44.50	-	16.94
APRIL	1752.37	927.44	-	114.01	202.43	-	92.67	312.12	-	12.87	81.45	9.38
MAY	1489.67	912.05	-	-	188.96	238.61	41.57	-	78.74	13.08	-	16.66
JUNE	1799.41	912.05	-	119.29	200.86	238.61	24.76	17.01	157.77	15.49	80.95	32.62
JULY	1336.18	909.99	-	-	200.96	-	51.25	-	88.90	71.92	-	13.16
AUG	1528.69	1376.80	-	109.81	6.10	-	11.20	-	-	15.12	-	9.66
SEPT	1877.41	1121.42	-	-	362.58	238.62	71.09	(17.01)	-	14.18	78.27	8.26
OCT	1773.60	944.90	-	-	209.21	238.61	21.51	-	161.48	87.29	93.76	16.84
NOV	2096.79	1053.02	-	-	209.36	238.61	63.21	-	84.11	395.23	-	53.25
DEC	2681.69	2365.36	-	-	182.64	-	69.31	-	(100.28)	67.58	85.83	11.25
TOTAL	21533.20	13963.47	-	561.61	2373.02	1660.05	504.85	361.24	623.72	765.09	514.91	205.24

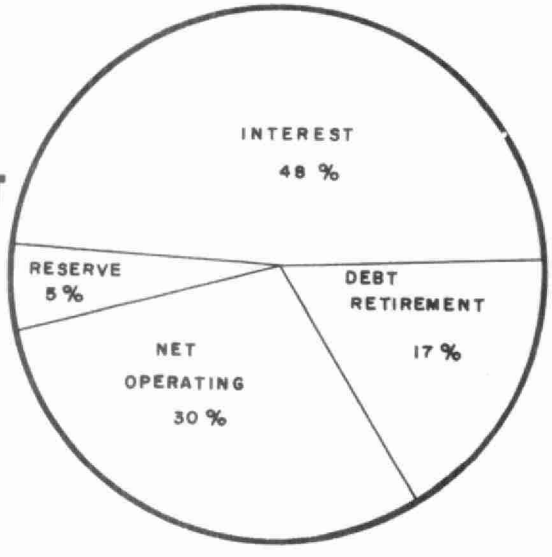
BRACKETS INDICATE CREDIT

CO

1968 OPERATING COSTS



TOTAL ANNUAL COST



Yearly Operating Costs

YEAR	M.G.TREATED	TOTAL COST	COST PER MILLION GALLONS	COST PER LB OF BOD REMOVED
1964	84. 180	$15, 120. 53	$179. 62	7 cents
1965	116. 884	15, 909. 13	136. 11	8 cents
1966	174. 330	17, 931. 30	102. 86	7. 3 cents
1967	224. 613	20, 300. 68	90. 38	9. 3 cents
1968	204. 18*	21, 533. 20	105. 46	11. 5 cents

Process Data

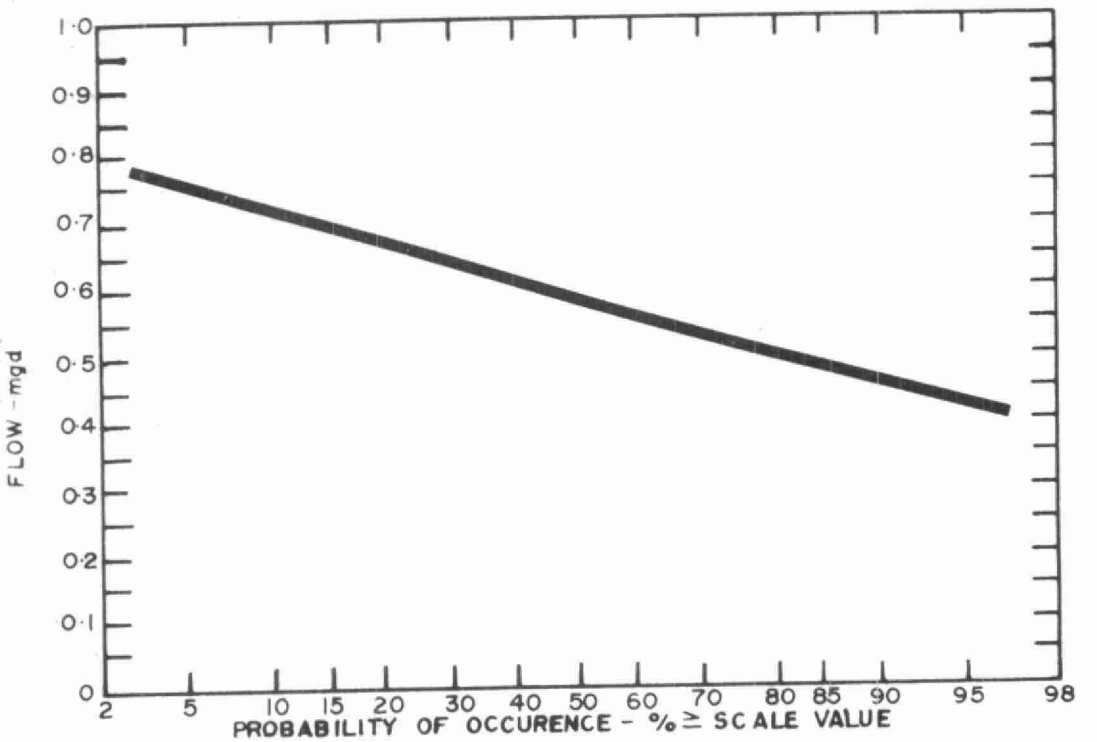
The flow recorder was taken out of service in November due to construction at the plant. However, based on ten months' data, the average daily flow was 550,000 gallons per day. The design plant flow of 334,000 gallons per day was exceeded more than 98% of the time. Also, approximately 20% of the time the plant flow exceeded twice the design flow (668,000 gallons). Flows up to the design flow were given full treatment and the excess was given primary treatment and chlorination.

A total of 10,264 lbs. of chlorine was used at an approximate dosage of 5.0 mg/l to maintain a residual of 0.5 mg/l in the plant effluent.

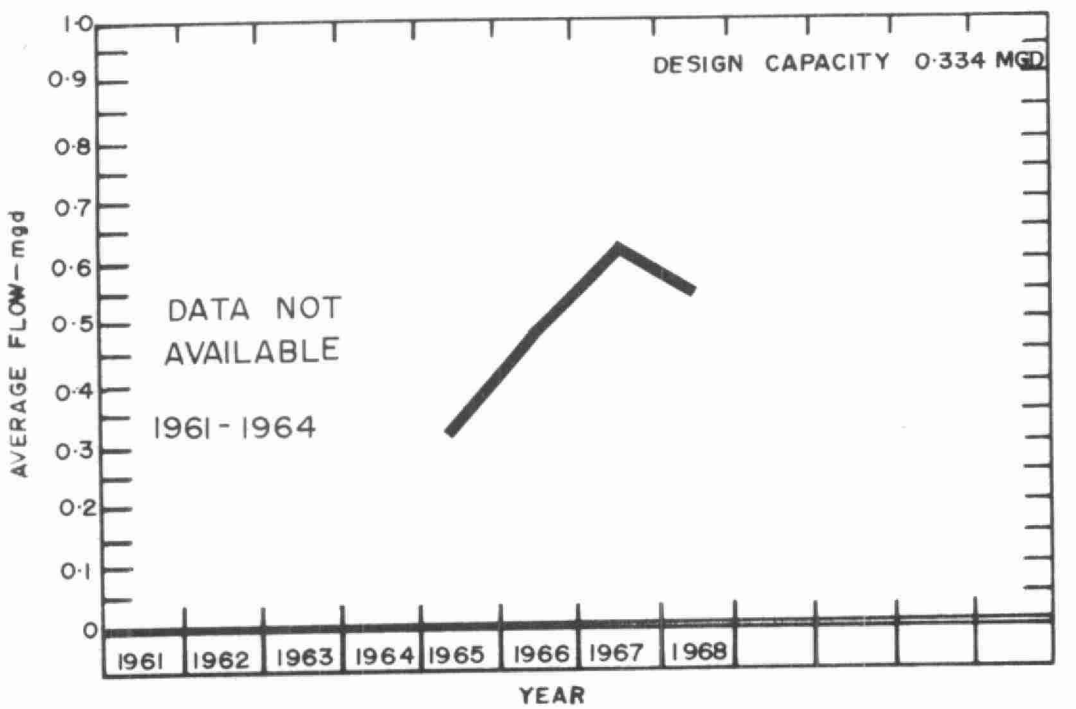
PLANT FLOWS and CHLORINATION

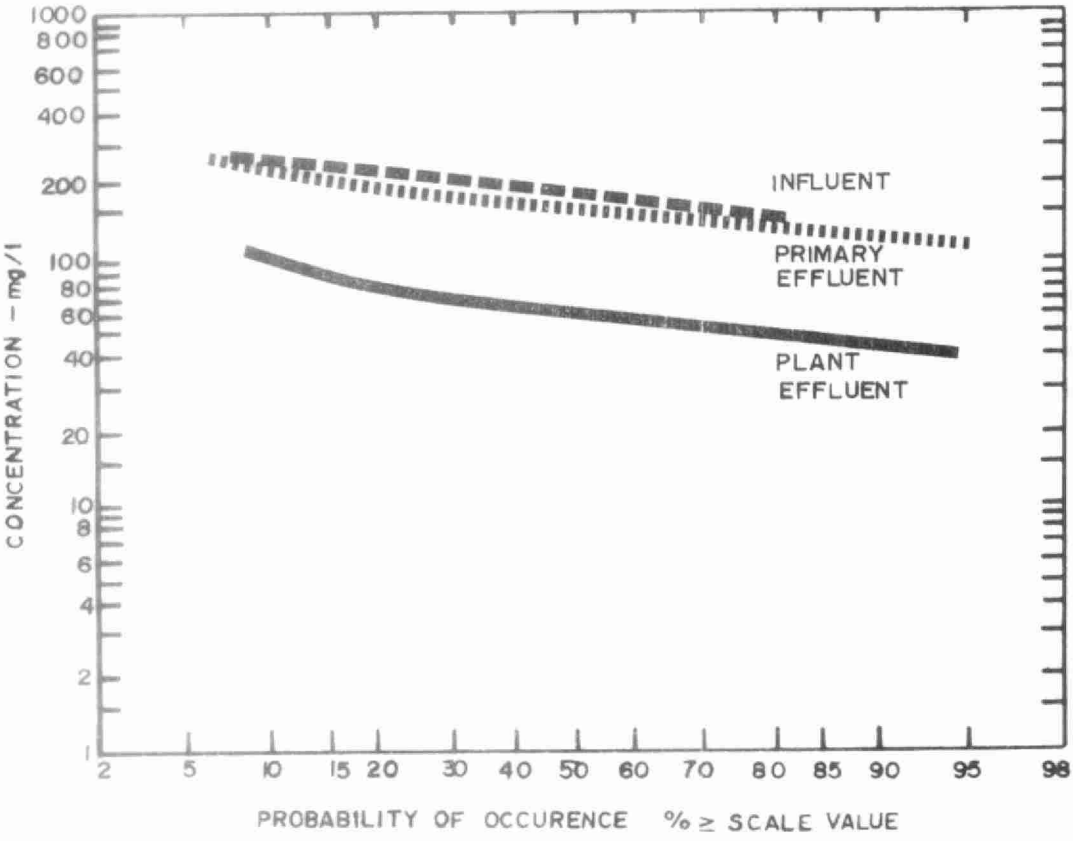
MONTH	TOTAL FLOW mg	AVERAGE DAILY FLOW mg	MAXIMUM DAILY FLOW mg	MINIMUM DAILY FLOW mg	CHLORINE USED lbs.	DOSAGE mg/l
JAN	19 16	.618	.800	.550	863	4 5
FEB	17.69	.610	.800	.500	805	4.6
MAR	19.66	.634	.800	.550	886	4.5
APR	18.41	.614	.700	.550	850	4.6
MAY	19.88	.641	.725	.500	899	4.5
JUN	17.21	.574	.750	.425	813	4.7
JUL	15.86	.512	.650	.393	830	5.2
AUG	15.20	.490	.656	.376	865	5.7
SEPT	13.85	.462	.594	.304	860	6.2
OCT	13.71	.442	.645	.281	918	6.7
NOV	-	-	-	-	900	-
DEC	-	-	-	-	775	-
TOTAL	-	-	-	-	10264	-
AVERAGE	-	.550 *	-	-	855	5.0 *

* Based on 10 months' data

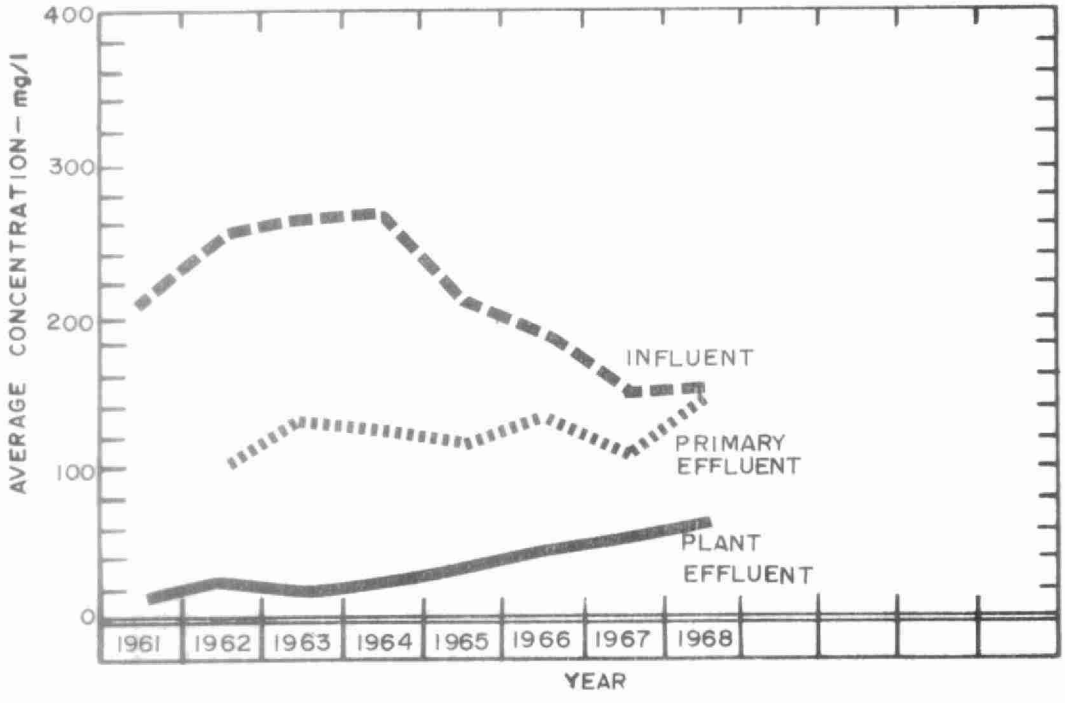

1·0
0·9
0·8
0·7
0·6
0·5
0·4
0·3
0·2
0·1
0
FLOW - mgd
2
5
10
15
20
30
40
50
60
70
80
85
90
95
98
PROBABILITY OF OCCURENCE - % ≥ SCALE VALUE

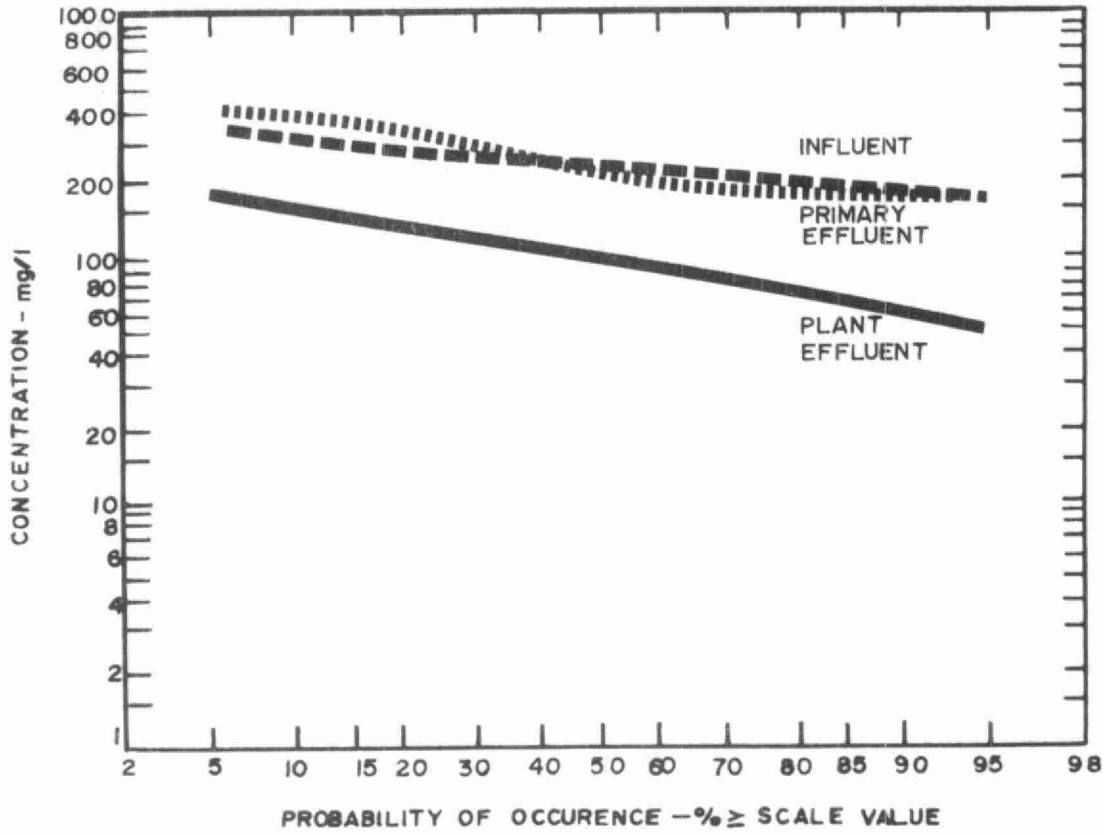
FLOWS


1·0
0·9
0·8
0·7
0·6
0·5
0·4
0·3
0·2
0·1
0
AVERAGE FLOW - mgd
DESIGN CAPACITY 0·334 MGD
DATA NOT AVAILABLE
1961 - 1964
1961
1962
1963
1964
1965
1966
1967
1968
YEAR

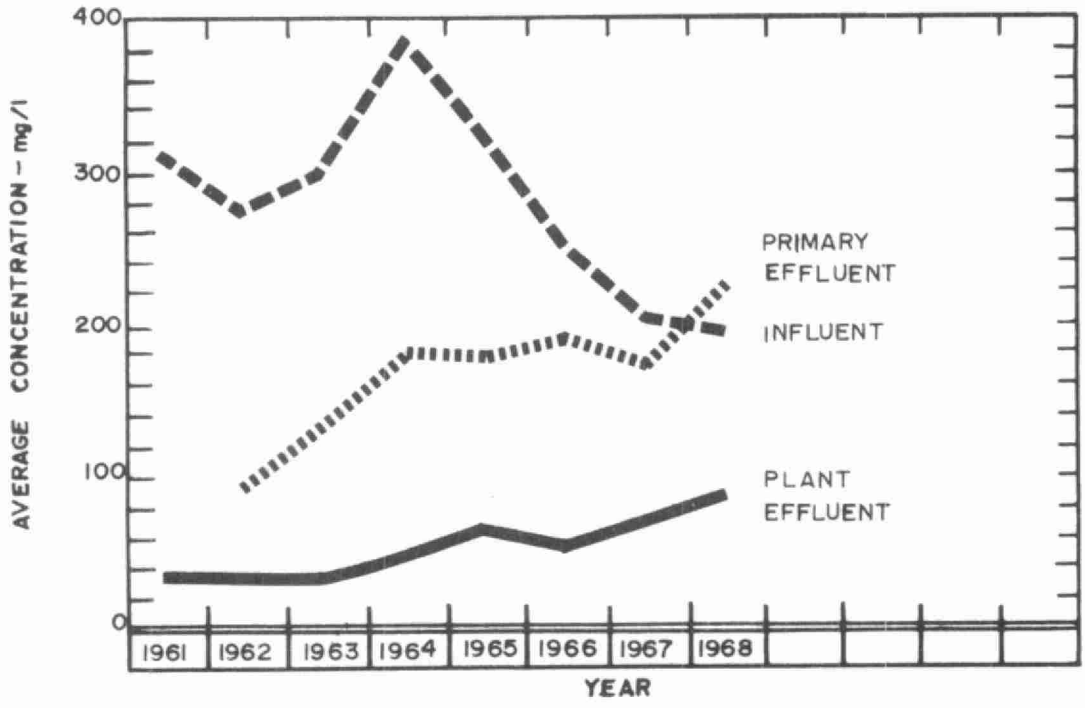


BIOCHEMICAL OXYGEN DEMAND





SUSPENDED SOLIDS



PLANT EFFICIENCY

MONTH	BIOCHEMICAL OXYGEN DEMAND				SUSPENDED SOLIDS				GRIT
	INF CONC^N mg/l	EFF CONC^N mg/l	RED^N %	REMOVAL 10^3 lb	INF CONC^N mg/l	EFF CONC^N mg/l	RED^N %	REMOVAL 10^3 lb	REMOVAL ft^3
JAN	147	58	60	17.0	236	49	79	35.8	120
FEB	205	65	68	24.8	273	102	63	30.2	45
MAR	115	108	6	1.4	83	98	0	0	45
APR	152	65	57	16.0	183	84	54	18.2	8
MAY	135	53	61	16.3	196	108	45	17.5	25
JUN	172	47	73	21.5	177	98	45	13.6	25
JULY	150	39	74	17.6	230	72	69	25.1	30
AUG	-	-	-	-	-	-	-	-	45
SEPT	-	-	-	-	-	-	-	-	90
OCT	-	-	-	-	-	-	-	-	149
NOV	-	-	-	-	-	-	-	-	50
DEC	-	-	-	-	-	-	-	-	40
TOTAL	-	-	-	-	-	-	-	-	672
AVERAGE	154	62	60	16.4	197	87	56	20.1	56

COMMENTS

The results for BOD and suspended solids are based on the first seven months of 1968. Construction of the extension to the plant prevented proper collection of samples for the remainder of the year.

An average of 16,400 lbs. of BOD per month was removed from the raw sewage during the first seven months. The average BOD concentration of the raw sewage and final effluent was 154 mg/l and 62 mg/l respectively, yielding a 60% removal effic ency.

An average of 20,100 lbs. of suspended solids per month was removed during the same period. The average concentrations of the suspended solids in the raw sewage and final effluent were 197 mg/l and 87 mg/l respectively, yielding a reduction of 56%.

The BOD and suspended solids concentrations of 62 mg/l and 87 mg/l in the final effluent seriously exceed the OWRC objectives of 15 mg/l for each. The extension to the plant should bring these concentrations within OWRC objectives.

The total grit removed from the raw sewage for 1968 was 672 cubic feet.

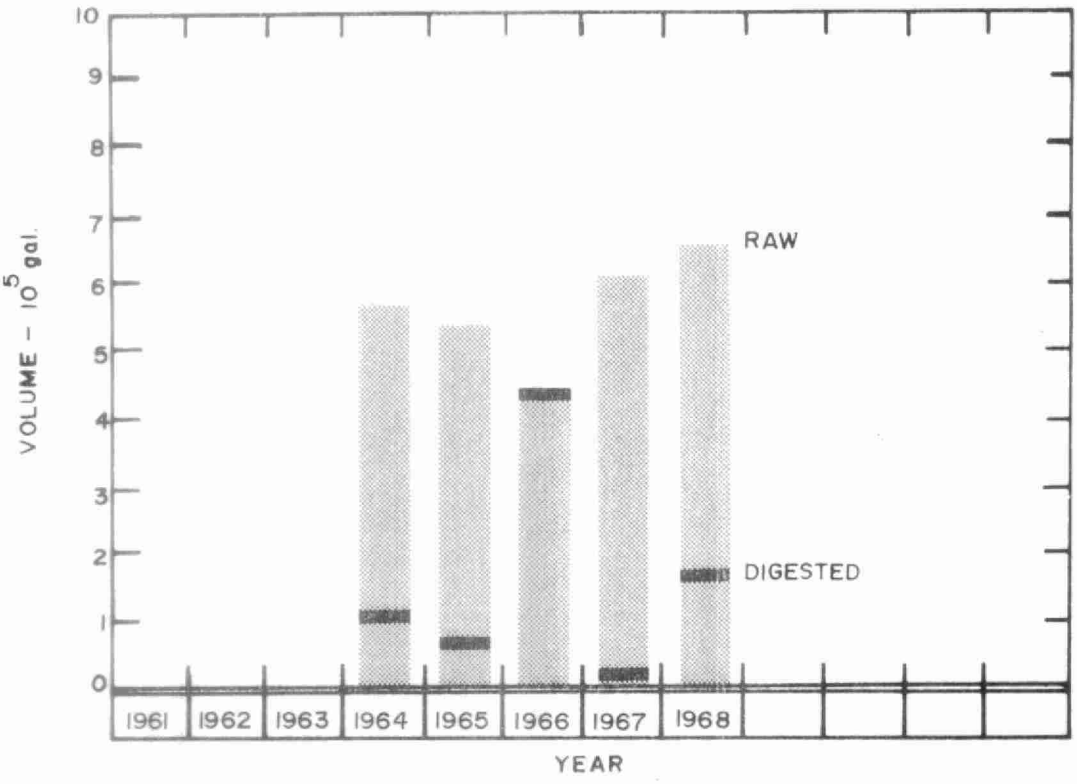
AERATION

MONTH	AVERAGE FLOW mgd	PRIMARY EFF BOD CONC^N mg/l	PRIMARY EFF SS CONC^N mg/l	SECONDARY EFF BOD CONC^N mg/l	SECONDARY EFF SS CONC^N mg/l	MLSS CONC^N mg/l	F/M (lb BOD / lb MLSS)	AIR USED (000 ft^3 / lb BOD REMOVED)	WASTE SLUDGE lb
JAN	.330	171	189	33	16	3100	.13	2.25	-
FEB	.330	187	261	18	19	3450	.13	1.83	-
MAR	.330	135	159	55	15	3460	.09	3.88	-
APRIL	.330	127	133	13	13	3000	.10	2.73	-
MAY	.330	125	220	21	20	3560	.08	3.00	-
JUN	.330	135	284	39	19	3370	.09	3.35	-
JUL	.330	142	299	21	18	3180	.11	2.64	-
AUG	.330	-	-	-	-	2510	-	-	-
SEPT	.330	-	-	-	-	2620	-	-	-
OCT	.442	-	-	-	-	3920	-	-	-
NOV	-*	-	-	-	-	8240	-	-	-
DEC	-*	-	-	-	-	1860	-	-	-
TOTAL	-	-	-	-	-	-	-	-	-
AVERAGE	.550	146	221	29	17	3520	.10	2.81	-

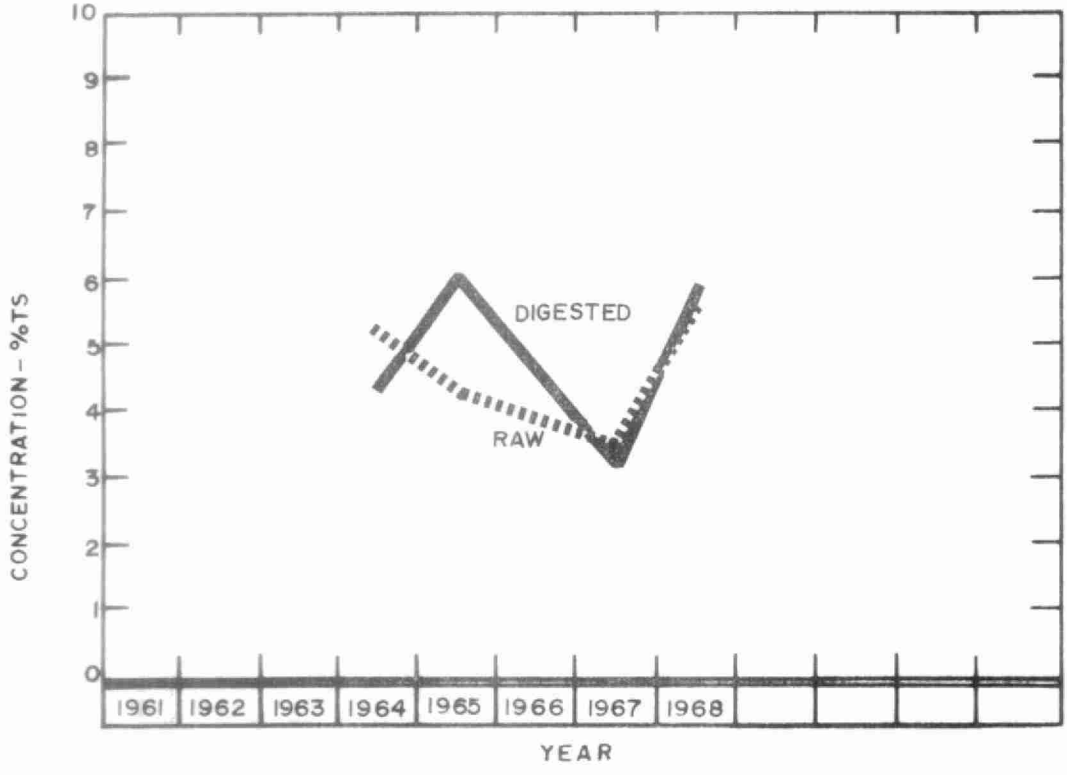
* Not Recorded

COMMENTS

The average concentration of the primary effluent BOD was 146 mg/l for the first seven months of 1968. The MLSS (Mixed liquor suspended solids concentration) was 3,520 mg/l for the year. The average F/M ratio or lbs. of BOD per lb. of MLSS was 0.10, which was below the usual range of 0.2 to 0.5 for conventional activated sludge plants. An average of 2,810 cubic feet of air was required to remove one pound of BOD from the aeration section.


VOLUME - 10^5 gal.
10
9
8
7
6
5
4
3
2
1
0
RAW
DIGESTED
1961
1962
1963
1964
1965
1966
1967
1968
YEAR

DIGESTION


CONCENTRATION - %TS
10
9
8
7
6
5
4
3
2
1
0
DIGESTED
RAW
1961
1962
1963
1964
1965
1966
1967
1968
YEAR

SLUDGE DIGESTION and DISPOSAL

MONTH	RAW SLUDGE			DIGESTED SLUDGE			SUPERNATANT		SLUDGE DISPOSAL	
	VOLUME 10^3 gal	T. S. %	V. S. %	VOLUME 10^3 gal	T. S. %	V. S. %	VOLUME 10^3 gal	T. S. %	LIQUID yd^3	DEWATERED yd^3
JAN	55.5	-	-	-	-	-	-	-	0	-
FEB	50.5	8.4	43	-	5.8	32	-	-	0	-
MAR	55.0	5.9	41	-	6.6	31	-	3.9	0	-
APR	59.5	-	-	29.0	-	-	-	0.3	0	-
MAY	62.0	-	-	8.4	-	-	-	-	0	-
JUN	60.0	5.4	57	15.5	-	-	-	-	0	-
JUL	48.0	3.0	17	20.2	5.4	37	-	-	0	-
AUG	62.0	-	-	29.0	-	-	-	-	0	-
SEPT	60.0	-	-	10.1	-	-	0.5	-	0	-
OCT	54.0	-	-	20.2	-	-	5.2	-	0	-
NOV	28.0	-	-	18.0	-	-	-	-	107	-
DEC	63.1	-	-	22.1	-	-	-	-	131	-
TOTAL	657.6	-	-	182.5	-	-	5.7	-	238	-
AVERAGE	54.8	5.6	40	15.2	5.9	33	-	2.1	-	-

COMMENTS

A total of 657,600 gallons of raw sludge was pumped to the digester during 1968. A total of 142,500 gallons of digested sludge was placed on the drying beds from April to October and 40,000 gallons of digested sludge were hauled by truck during November and December.

The reduction of the volatile solids was good, although the volatile matter in the raw sludge is quite low. Digester mixing in 1969 is expected to improve the volatile solids reduction.

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CONCLUSIONS

The poor quality of the final effluent was due to the extreme hydraulic overload. The extention to the plant, to be completed in early 1969, will substantially improve the plant effluent. However, it is not expected that the expanded plant will produce completely satisfactory results, since flows in 1968 exceeded the expanded capacity 20 percent of the time. There is now a proposal to increase plant capacity further, and provide tertiary treatment for the removal of nutrients.

Date Due

MAR 12 1970			
APR 29 1970			

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